

ECE 403: Senior Design II
North Dakota State University
Homework 1: Requirements Capture
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Requirements Capture

Introduction

Our design project focuses on creating a device for acquisition of data pertaining to available solar and wind power in a remote location. This data would be used to determine what types of off-grid renewable energy systems would work best for the location. There is information available on the web regarding weather patterns and available sunlight for certain regions, but this data can vary greatly from location to location within a small area due to terrain features or other local factors. Our system will address this by being able to be left on site to collect data for that specific location.

Requirements:

- Must be rugged, needs to be able to withstand extended exposure to the elements and possibly wildlife.
- Must have enough data capacity to be able to store temperature, solar energy, and wind speed (and possibly direction) over an extended period of time.
- Must be able to retrieve data from the system, whether that is via removable storage, such as an SD card or USB flash drive, or via wireless transmission.
- Must use a calibrated photovoltaic cell or a solar panel to measure available solar energy at the location.
- Must use an anemometer or other similar device to measure the wind speed for assessment of available wind power at the location,
- Must use some type of sensor for temperature measurement at the location.
- Must be designed for minimal power consumption, as it may be required to operate autonomously for an extended period of time, possibly several months.
- All components must be able to withstand temperatures between 15°F and 105°F, which are the recorded record low and high for one of the locations we may be using the device.

- All components must be able to withstand exposure to rain, so packaging of the device should be waterproof or water-resistant.
- Anemometer/Light Sensing Device should be able to withstand wind speeds of up to 60mph while remaining operational.
- Anemometer/Light Sensing Device must relay data to the housing by some method so that data can be processed and stored.
- There should be no special tools required for by the end-user for assembly/setup.
- Cables must either be animal and weather resistant or housed in a durable conduit of some type.

Summary

Using a system controlled by a microprocessor, we will design a device which will take solar energy and wind speed measurements on site, perform calculations on this data, and store usable data in some sort of storage, probably flash memory. The device will have to be rugged, as it will be exposed to the elements for an extended period of time. There are several hurdles we must overcome to design a viable data acquisition system, and more research is required at this point to determine what our best options are for overcoming these obstacles and meeting the requirements as laid out above.